

the reflector acceleration being in a direction opposite to the acceleration provided by the pulser; and

a detector that receives the reflected ion beam from the reflector and provides temporally resolved measurement of the ion beam, wherein the gridless slit diaphragms of the pulser and the reflector provide focusing of the ion beam on the detector in a direction parallel to an axis  $z$  that is perpendicular to both the  $x$ -axis and the  $y$ -axis.

2. A time-of-flight mass spectrometer according to Claim 1, wherein the spectrometer includes at least one two-stage reflector with two slit diaphragms, one short deceleration field and one reflection field that contribute to said ion beam focusing.
3. A time-of-flight mass spectrometer according to Claim 1, further comprising at least one cylindrical lens that extends parallel to the  $x$ -axis and contributes to said focusing of the band-shaped ion beam.
4. A time-of-flight mass spectrometer according to Claim 3, wherein the spectrometer comprises at least one cylindrical Einzel lens made up of two outer slit diaphragms at ambient potential and one inner slit diaphragm at a lens potential.
5. A time-of-flight mass spectrometer according to Claim 4, wherein only one cylindrical Einzel lens is used which is positioned very close to the pulser, such that in a boundary case of diminishing distance the pulser and cylindrical Einzel lens have a common slit diaphragm.
6. A time-of-flight mass spectrometer according to Claim 4, wherein the cylindrical Einzel lens has an inner slit diaphragm with two jaws that can be connected to slightly different potentials for adjusting the direction of the band-shaped ion beam in the  $z$ -direction.

7. A time-of-flight mass spectrometer according to Claim 1, wherein the pulser has two slit diaphragm electrodes and one repeller electrode, of which only the repeller electrode, the first slit diaphragm or both together are used for pulsing the ions located between the repeller electrode and the first slit diaphragm by means of voltage changes, while there is constant potential at the second slit diaphragm.
8. A time-of-flight mass spectrometer according to Claim 1, wherein at least two reflectors are used which are slightly rotated round the x-axis, so that the ion beam is slightly reflected out of the x-y plane in the z-direction forming a zig-zag beam in the projection onto a y-z plane.
9. A time-of-flight mass spectrometer according to Claim 8, further comprising an electrical capacitor that generates a capacitor field parallel to the x-axis and that deflects the band-shaped ion beam in a direction parallel to the y-axis after it leaves the pulser.